Lake Simcoe Region conservation authority

Lake Simcoe Region Conservation Authority

Lake Simcoe Climate Data:

A Reference Document to Support the Completion of Water Balance Assessments

April 2017
Version 1.0

Disclaimer

This document has been provided in an attempt to standardize and aid in evaluation of water balance assessments completed to support development applications reviewed by the Lake Simcoe Region Conservation Authority and should be referred to for this purpose only. The data contained within this document are results from the Lake Simcoe PRMS model developed by Earthfx (2010) and published in the Lake Simcoe and Couchiching-Black River Source Protection Area Approved Assessment Report (2015) which should be referred to for more information.

Users must exercise judgment and flexibly to adapt the data provided when considering specific site conditions and when new information or data becomes available. It is not the intent of the Lake Simcoe Region Conservation Authority to prescribe the methodology nor the data used to undertake water balance assessments, rather it is intended to provide responsible estimates based on current knowledge and evaluation of the conditions within each subwatershed. Where the Qualified Person can show that alternate approaches/data can produce the desired results or even better, such methods and data should be considered. The Qualified Person is solely responsible for the water balance assessments provided to the Lake Simcoe Conservation Authority supporting Land Development Applications for any given site. This document should be used with other established manuals and practices.

Publication Information

Comments on this document should be directed to:

Shelly Cuddy, P.Geo.
Hydrogeologist
Lake Simcoe Region Conservation Authority
120 Bayview Parkway
Newmarket, Ontario, Canada L3Y 3W3
s.cuddy@lsrca.on.ca

Contents

Introduction 4
Water Balance Methodology 5
References....7
Appendix A: Climate Data Tables 8
Barrie Creeks Subwatershed....8
Beaver River Subwatershed....9
Black River Subwatershed 10
East Holland Subwatershed....11
Georgina Creeks Subwatershed....12
Hawkestone Creek Subwatershed 13
Hewitts Creek Subwatershed....14
Innisfil Creek Subwatershed....15
Lovers Creek Subwatershed....16
Maskinonge River Subwatershed 17
Oro Creeks North Subwatershed 18
Oro Creeks South Subwatershed 19
Pefferlaw Brook Subwatershed 20
Ramara Creeks Subwatershed....21
Talbot River Subwatershed....22
Upper Talbot River Subwatershed....23
Uxbridge Brook Subwatershed 24
West Holland Subwatershed 25
Whites Creek Subwatershed....26

Introduction

Water balance methods are an appropriate means for predicting the changes to the hydrologic cycle that results from urban development. They can be used to determine amounts of water that should be infiltrated to compensate for reductions caused by large paved areas or changes to vegetation.

The maintenance of pre-development 'recharge' is a general requirement in the Oak Ridges Moraine Conservation Plan (ORMCP), Lake Simcoe Protection Plan (LSPP), the South Georgian Bay Lake Simcoe (SGBLS) Source Protection Plan and the Provincial Policy Statement (PPS) that is often captured in municipal Official Plans. Groundwater frequently supports significant watershed features that are necessary components to the maintenance of a healthy watershed. As a result, a water balance analysis is required to estimate the pre-development and post-development infiltration and runoff for most development applications within the Lake Simcoe Region Conservation Authority as outlined in Table 1.

This document aims at providing a standard dataset for land development applicants and their consultants to use when completing water balance analysis. Qualified Persons (QP) should exercise professional judgment and flexibly to adapt the data provided when considering specific site conditions and when new information or data becomes available. It is not the intent of the Lake Simcoe Region Conservation Authority to prescribe the methodology or the data used; rather it is intended to provide responsible estimates based on current knowledge and evaluation of the conditions within each subwatershed. Where there is an alternate approach or data available that can produce the desired results or even better, such methods and data should be considered.

Table 1: Legislation requirements for water balance assessments within the Lake Simcoe Region Conservation Authority	
Legislative Authority:	**Policy Requirements:**
Oak Ridges Moraine	Hydrogeological assessment, pre and post- development water balance required for all major development.
Lake Simcoe Protection Plan – 4.8 Designated Policy	Pre and post- development water balance required for all major development and show how such changes shall be minimized.
Lake Simcoe Protection Plan – 6.40 Designated Policy	Outside of the Oak Ridges Moraine area, an application for major development within a significant groundwater recharge area (SGRA) shall be accompanied by an environmental impact study that demonstrates that the quality and quantity of groundwater in these areas and the function of the recharge areas will be protected, improved or restored.
South Georgian Bay Lake Simcoe Source Protection Plan – Policy LUP-12	For Planning Act applications within the WHPA-Q2 a hydrogeological study is required to show that the existing water balance can be maintained through the use of best management practices. Where necessary implementation and maximization of off-site recharge enhancement within the same WHPA-Q2 may be used to compensate for any predicted loss of recharge from the development. *excludes single detached residential, barns and non-commercial structures that are accessory to an agricultural operation.
Notes: Major development for ORMCP and LSPP includes any site which has a proposed ***building*** footprint of 500 square metres or greater. Major development for SGBLS SPP includes any site which has a proposed ***impervious*** footprint of 500 square metres or greater.	

Water Balance Methodology

The purpose of the water balance analysis is to reasonably estimate the current infiltration rates to the subsurface and to then determine how much this rate will change as a result of the proposed development. It is recognized that site specific water balances are difficult to accurately estimate; the goal should be to assess the difference between pre-development and post development conditions and to mitigate for impacts on infiltration.

The terms 'infiltration' and 'recharge' are commonly used interchangeably in development application supporting documents. Infiltration relates to the capacity for the soil to allow water to enter the subsurface. Some of this infiltration results in lateral movement in the shallow unsaturated zone where interflow may predominate and some of the infiltration is directed downward to the deeper aquifer system. Recharge is considered to be primarily water that reaches the saturated zone of the aquifer and becomes part of the regional groundwater flow

system. The maintenance of infiltration rates is essential to the sustainability of the groundwater flow system which may support local significant ecological features. In addition, infiltration may move to a regional deeper flow system that may be important at a regional scale from either an ecological or water supply perspective.

It is common practice and an accepted method to provide estimates of surplus using a Thornthwaite and Mather approach where surplus is estimated based on precipitation minus evapotranspiration (Steenhuis and Van Der Molen, 1986). Infiltration portion of the surplus can be estimated by applying the infiltration factors provided in the Ministry of the Environment and Energy Hydrogeological Technical Information Requirements for Land Development Applications (1995). These factors consider slope, vegetation and soils. The remainder of surplus is considered to be runoff.

With the recent completion of technical studies required under The Clean Water Act, 2006, numerical models were utilized to estimate, interception, evaporation, potential and actual evapotranspiration, snowmelt, runoff, infiltration, interflow, and groundwater recharge. Many of these model estimates are based on soils, surficial geology and land use mapping products but may also consider detailed vegetation attributes as well as hydrological cycle functions. These modelling output data are available and consultants are encouraged to use them completing site specific water balance assessments.

The water balance tables provided in this document are average values obtained from the numerical modelling undertaken by Earthfx (2010) required under the Clean Water Act, 2006. The resulting water balance parameters are categorized by various vegetation covers in different soil types for each subwatershed within the Lake Simcoe Basin. Infiltration factors can then be applied based on specific site conditions – vegetation, soil and topography, per the above mentioned MOE methodology. When applied to an appropriate catchment area, they can provide reasonable estimates of infiltration for comparison purposes.

This document is meant to summarize the PRMS modelling results (Earthfx, 2010) and not to provide detailed water balance methodology. For additional information on completing hydrogeological water balance assessments please refer to The Ontario Ministry of the Environment Stormwater Planning and Design Manual (2003), Ministry of the Environment and Energy Hydrogeological Technical Information Requirements for Land Development Applications (1995) or the Hydrogeological Assessment Submissions – Conservation Authority Guidelines for Development Applications (2013). In addition, pre-consultation with the Lake Simcoe Region Conservation Authority is strongly recommended to determine the policy context and the scope of your study.

References

Conservation Authorities Geoscience Working Group. 2013. Hydrogeological Assessment Submissions-Conservation Authority Guidelines for Development Applications.

Earthfx Inc. 2010. Water Balance Analysis of the Lake Simcoe Basin using the Precipitation-Runoff Modelling System (PRMS).

Ministry of Environment and Energy. 1995, MOEE Hydrogeological Technical Information Requirements for Land Development Applications.

Ministry of the Environment. 2003. Stormwater Management Planning and Design Manual.

South Georgian Bay-Lake Simcoe Source Protection Committee, 2015. Approved Assessment Report: Lake Simcoe and Couchiching-Black River Source Protection Area Part 1.

Appendix A: Climate Data Tables

Barrie Creeks Subwatershed

	Hydrologic Soil Group	Subwatershed Area (km^2)	Mean Annual Precipitation (mm/yr.)	Actual Evapotranspiration (mm/yr.)	Precipitation Surplus (mm/yr.)
Urban Lawns/Golf Courses					
Fine Sand	A	1.74	952	525	427
Fine Sandy Loam	B		952	539	413
Silt Loam	C		952	573	380
Clay	D		952	643	310
Forest					
Fine Sand	A	4.12	952	521	431
Fine Sandy Loam	B		952	540	412
Silt Loam	C		952	434	518
Clay	D		952	598	354
Pasture & Shrubs					
Fine Sand	A	0.40	952	565	387
Fine Sandy Loam	B		952	546	406
Silt Loam	C		952	558	394
Clay	D		-	-	-
Non-Intensive Agriculture (e.g. Hay)					
Fine Sand	A	0.92	952	528	424
Fine Sandy Loam	B		952	636	316
Silt Loam	C		-	-	-
Clay	D		-	-	-
Intensive Agriculture (e.g. Row crop)					
Fine Sand	A	0.43	952	556	396
Fine Sandy Loam	B		952	532	420
Silt Loam	C		-	-	-
Clay	D		-	-	-
Open Alvar					
Fine Sand	A	-	-	-	-
Fine Sandy Loam	B		-	-	-
Silt Loam	C		-	-	-
Clay	D		-	-	-
Aggregates					
Fine Sand	A	0.62	952	471	481
Fine Sandy Loam	B		952	456	496
Silt Loam	C		-	-	-
Clay	D		-	-	-
Mean Annual			**952**	**446**	**506**

Notes: Precipitation and Actual Evapotranspiration values are the AVERAGE ANNUAL estimates obtained from the Lake Simcoe PRMS model (Earthfx, 2010).

Beaver River Subwatershed

	Hydrologic Soil Group	Subwatershed Area (km^2)	Mean Annual Precipitation (mm/yr.)	Actual Evapotranspiration (mm/yr.)	Precipitation Surplus (mm/yr.)
Urban Lawns/Golf Courses					
Fine Sand	A	1.41	905	582	323
Fine Sandy Loam	B		905	594	311
Silt Loam	C		905	589	316
Clay	D		-	-	-
Forest					
Fine Sand	A	27.16	905	561	344
Fine Sandy Loam	B		905	629	276
Silt Loam	C		905	610	295
Clay	D		905	643	262
Pasture & Shrubs					
Fine Sand	A	6.88	905	550	355
Fine Sandy Loam	B		905	620	285
Silt Loam	C		905	613	292
Clay	D		905	584	321
Non-Intensive Agriculture (e.g. Hay)					
Fine Sand	A	106.22	905	584	321
Fine Sandy Loam	B		905	647	258
Silt Loam	C		905	649	256
Clay	D		905	636	269
Intensive Agriculture (e.g. Row crop)					
Fine Sand	A	96.36	905	569	336
Fine Sandy Loam	B		905	653	252
Silt Loam	C		905	649	256
Clay	D		905	656	249
Open Alvar					
Fine Sand	A	-	-	-	-
Fine Sandy Loam	B		-	-	-
Silt Loam	C		-	-	-
Clay	D		-	-	-
Aggregates					
Fine Sand	A	4.39	905	477	428
Fine Sandy Loam	B		905	515	390
Silt Loam	C		905	495	410
Clay	D		-	-	-
Mean Annual			**905**	**610**	**295**

Notes: Precipitation and Actual Evapotranspiration values are the AVERAGE ANNUAL estimates obtained from the Lake Simcoe PRMS model (Earthfx, 2010).

Black River Subwatershed

	Hydrologic Soil Group	Subwatershed Area (km^2)	Mean Annual Precipitation (mm/yr.)	Actual Evapotranspiration (mm/yr.)	Precipitation Surplus (mm/yr.)
Urban Lawns/Golf Courses					
Fine Sand	A	3.13	895	564	331
Fine Sandy Loam	B		895	579	316
Silt Loam	C		895	569	326
Clay	D		895	596	299
Forest					
Fine Sand	A	73.90	895	578	317
Fine Sandy Loam	B		895	605	290
Silt Loam	C		895	589	306
Clay	D		895	632	263
Pasture & Shrubs					
Fine Sand	A	14.32	895	581	314
Fine Sandy Loam	B		895	605	290
Silt Loam	C		895	591	304
Clay	D		895	607	288
Non-Intensive Agriculture (e.g. Hay)					
Fine Sand	A	57.67	895	581	314
Fine Sandy Loam	B		895	603	292
Silt Loam	C		895	624	271
Clay	D		895	601	294
Intensive Agriculture (e.g. Row crop)					
Fine Sand	A	86.23	895	585	310
Fine Sandy Loam	B		895	615	280
Silt Loam	C		895	620	275
Clay	D		895	652	243
Open Alvar					
Fine Sand	A	-	-	-	-
Fine Sandy Loam	B		-	-	-
Silt Loam	C		-	-	-
Clay	D		-	-	-
Aggregates					
Fine Sand	A	3.53	895	486	409
Fine Sandy Loam	B		895	509	386
Silt Loam	C		895	485	410
Clay	D		-	-	-
Mean Annual			**895**	**574**	**320**

Notes: Precipitation and Actual Evapotranspiration values are the AVERAGE ANNUAL estimates obtained from the Lake Simcoe PRMS model (Earthfx, 2010).

East Holland Subwatershed

	Hydrologic Soil Group	Subwatershed Area (km^2)	Mean Annual Precipitation (mm/yr.)	Actual Evapotranspiration (mm/yr.)	Precipitation Surplus (mm/yr.)
Urban Lawns/Golf Courses					
Fine Sand	A	10.04	878	579	299
Fine Sandy Loam	B		878	638	240
Silt Loam	C		878	594	283
Clay	D		878	613	265
Forest					
Fine Sand	A	39.28	878	608	270
Fine Sandy Loam	B		878	624	253
Silt Loam	C		878	600	278
Clay	D		878	618	260
Pasture & Shrubs					
Fine Sand	A	11.08	878	601	276
Fine Sandy Loam	B		878	621	256
Silt Loam	C		878	606	272
Clay	D		878	594	283
Non-Intensive Agriculture (e.g. Hay)					
Fine Sand	A	24.28	878	622	256
Fine Sandy Loam	B		878	649	229
Silt Loam	C		878	632	246
Clay	D		878	619	259
Intensive Agriculture (e.g. Row crop)					
Fine Sand	A	48.80	878	601	276
Fine Sandy Loam	B		878	646	231
Silt Loam	C		878	648	230
Clay	D		878	647	231
Open Alvar					
Fine Sand	A	-	-	-	-
Fine Sandy Loam	B		-	-	-
Silt Loam	C		-	-	-
Clay	D		-	-	-
Aggregates					
Fine Sand	A	24.28	878	508	371
Fine Sandy Loam	B		878	532	346
Silt Loam	C		878	462	417
Clay	D		-	-	-
Mean Annual			**878**	**567**	**311**

Notes: Precipitation and Actual Evapotranspiration values are the AVERAGE ANNUAL estimates obtained from the Lake Simcoe PRMS model (Earthfx, 2010).

Georgina Creeks Subwatershed

	Hydrologic Soil Group	Subwatershed Area (km^2)	Mean Annual Precipitation (mm/yr.)	Actual Evapotranspiration (mm/yr.)	Precipitation Surplus (mm/yr.)
Urban Lawns/Golf Courses					
Fine Sand	A	1.19	907	550	357
Fine Sandy Loam	B		907	568	339
Silt Loam	C		907	664	243
Clay	D		907	593	314
Forest					
Fine Sand	A	9.69	907	575	332
Fine Sandy Loam	B		907	594	313
Silt Loam	C		907	594	313
Clay	D		907	643	264
Pasture & Shrubs					
Fine Sand	A	1.02	907	592	315
Fine Sandy Loam	B		907	612	295
Silt Loam	C		907	585	322
Clay	D		907	651	257
Non-Intensive Agriculture (e.g. Hay)					
Fine Sand	A	2.59	907	649	258
Fine Sandy Loam	B		907	624	283
Silt Loam	C		907	640	267
Clay	D		907	610	297
Intensive Agriculture (e.g. Row crop)					
Fine Sand	A	12.98	907	616	291
Fine Sandy Loam	B		907	642	265
Silt Loam	C		907	640	267
Clay	D		907	647	260
Open Alvar					
Fine Sand	A	-	-	-	-
Fine Sandy Loam	B		-	-	-
Silt Loam	C		-	-	-
Clay	D		-	-	-
Aggregates					
Fine Sand	A	-	-	-	-
Fine Sandy Loam	B		-	-	-
Silt Loam	C		-	-	-
Clay	D		-	-	-
Mean Annual			**907**	**576**	**331**

Notes: Precipitation and Actual Evapotranspiration values are the AVERAGE ANNUAL estimates obtained from the Lake Simcoe PRMS model (Earthfx, 2010).

Hawkestone Creek Subwatershed

	Hydrologic Soil Group	Subwatershed Area (km^2)	Mean Annual Precipitation (mm/yr.)	Actual Evapotranspiration (mm/yr.)	Precipitation Surplus (mm/yr.)
Urban Lawns/Golf Courses					
Fine Sand	A	0.37	-	-	-
Fine Sandy Loam	B		973	656	317
Silt Loam	C		-	-	-
Clay	D		-	-	-
Forest					
Fine Sand	A	13.95	973	551	422
Fine Sandy Loam	B		973	629	344
Silt Loam	C		973	588	385
Clay	D		973	671	303
Pasture & Shrubs					
Fine Sand	A	1.25	973	551	422
Fine Sandy Loam	B		973	620	353
Silt Loam	C		973	644	329
Clay	D		973	647	326
Non-Intensive Agriculture (e.g. Hay)					
Fine Sand	A	10.50	973	586	387
Fine Sandy Loam	B		973	643	330
Silt Loam	C		973	617	356
Clay	D		973	653	320
Intensive Agriculture (e.g. Row crop)					
Fine Sand	A	5.83	973	601	372
Fine Sandy Loam	B		973	647	326
Silt Loam	C		973	608	365
Clay	D		973	667	306
Open Alvar					
Fine Sand	A	-	-	-	-
Fine Sandy Loam	B		-	-	-
Silt Loam	C		-	-	-
Clay	D		-	-	-
Aggregates					
Fine Sand	A	0.97	973	478	495
Fine Sandy Loam	B		-	-	-
Silt Loam	C		-	-	-
Clay	D		-	-	-
Mean Annual			**973**	**589**	**385**

Notes: Precipitation and Actual Evapotranspiration values are the AVERAGE ANNUAL estimates obtained from the Lake Simcoe PRMS model (Earthfx, 2010).

Hewitts Creek Subwatershed

	Hydrologic Soil Group	Subwatershed Area (km^2)	Mean Annual Precipitation (mm/yr.)	Actual Evapotranspiration (mm/yr.)	Precipitation Surplus (mm/yr.)
Urban Lawns/Golf Courses					
Fine Sand	A	0.20	939	654	285
Fine Sandy Loam	B		939	539	401
Silt Loam	C		-	-	-
Clay	D		-	-	-
Forest					
Fine Sand	A	1.48	939	547	392
Fine Sandy Loam	B		939	586	353
Silt Loam	C		939	649	290
Clay	D		-	-	-
Pasture & Shrubs					
Fine Sand	A	0.41	939	498	441
Fine Sandy Loam	B		939	640	299
Silt Loam	C		939	662	278
Clay	D		-	-	-
Non-Intensive Agriculture (e.g. Hay)					
Fine Sand	A	1.58	939	566	373
Fine Sandy Loam	B		939	618	321
Silt Loam	C		939	621	318
Clay	D		-	-	-
Intensive Agriculture (e.g. Row crop)					
Fine Sand	A	7.47	939	613	326
Fine Sandy Loam	B		939	624	315
Silt Loam	C		939	641	298
Clay	D		-	-	-
Open Alvar					
Fine Sand	A	-	-	-	-
Fine Sandy Loam	B		-	-	-
Silt Loam	C		-	-	-
Clay	D		-	-	-
Aggregates					
Fine Sand	A	-	-	-	-
Fine Sandy Loam	B		-	-	-
Silt Loam	C		-	-	-
Clay	D		-	-	-
Mean Annual			**939**	**567**	**372**

Notes: Precipitation and Actual Evapotranspiration values are the AVERAGE ANNUAL estimates obtained from the Lake Simcoe PRMS model (Earthfx, 2010).

Innisfil Creek Subwatershed

	Hydrologic Soil Group	Subwatershed Area (km^2)	Mean Annual Precipitation (mm/yr.)	Actual Evapotranspiration (mm/yr.)	Precipitation Surplus (mm/yr.)
Urban Lawns/Golf Courses					
Fine Sand	A	1.44	909	538	371
Fine Sandy Loam	B		909	578	331
Silt Loam	C		909	549	360
Clay	D		-	-	-
Forest					
Fine Sand	A	18.24	909	534	375
Fine Sandy Loam	B		909	575	334
Silt Loam	C		909	584	325
Clay	D		909	571	338
Pasture & Shrubs					
Fine Sand	A	1.71	909	572	337
Fine Sandy Loam	B		909	596	313
Silt Loam	C		909	585	324
Clay	D		-	-	-
Non-Intensive Agriculture (e.g. Hay)					
Fine Sand	A	17.89	909	627	282
Fine Sandy Loam	B		909	625	284
Silt Loam	C		909	655	254
Clay	D		-	-	-
Intensive Agriculture (e.g. Row crop)					
Fine Sand	A	29.78	909	606	303
Fine Sandy Loam	B		909	625	284
Silt Loam	C		909	674	235
Clay	D		909	664	245
Open Alvar					
Fine Sand	A	-	-	-	-
Fine Sandy Loam	B		-	-	-
Silt Loam	C		-	-	-
Clay	D		-	-	-
Aggregates					
Fine Sand	A	0.56	909	462	447
Fine Sandy Loam	B		909	454	455
Silt Loam	C		909	456	453
Clay	D		-	-	-
Mean Annual			**909**	**571**	**339**

Notes: Precipitation and Actual Evapotranspiration values are the AVERAGE ANNUAL estimates obtained from the Lake Simcoe PRMS model (Earthfx, 2010).

Lovers Creek Subwatershed

	Hydrologic Soil Group	Subwatershed Area (km^2)	Mean Annual Precipitation (mm/yr.)	Actual Evapotranspiration (mm/yr.)	Precipitation Surplus (mm/yr.)
Urban Lawns/Golf Courses					
Fine Sand	A	1.69	914	537	377
Fine Sandy Loam	B		914	571	343
Silt Loam	C		914	585	329
Clay	D		-	-	-
Forest					
Fine Sand	A	8.05	914	574	340
Fine Sandy Loam	B		914	557	357
Silt Loam	C		914	593	321
Clay	D		914	560	354
Pasture & Shrubs					
Fine Sand	A	1.66	914	566	348
Fine Sandy Loam	B		914	582	332
Silt Loam	C		914	658	256
Clay	D		-	-	-
Non-Intensive Agriculture (e.g. Hay)					
Fine Sand	A	3.89	914	571	343
Fine Sandy Loam	B		914	608	306
Silt Loam	C		914	650	264
Clay	D		-	-	-
Intensive Agriculture (e.g. Row crop)					
Fine Sand	A	16.20	914	589	325
Fine Sandy Loam	B		914	623	291
Silt Loam	C		914	646	268
Clay	D		914	523	391
Open Alvar					
Fine Sand	A	-	-	-	-
Fine Sandy Loam	B		-	-	-
Silt Loam	C		-	-	-
Clay	D		-	-	-
Aggregates					
Fine Sand	A	0.20	914	493	421
Fine Sandy Loam	B		914	529	385
Silt Loam	C		-	-	-
Clay	D		-	-	-
Mean Annual			**914**	**545**	**369**

Notes: Precipitation and Actual Evapotranspiration values are the AVERAGE ANNUAL estimates obtained from the Lake Simcoe PRMS model (Earthfx, 2010).

Maskinonge River Subwatershed

	Hydrologic Soil Group	Subwatershed Area (km^2)	Mean Annual Precipitation (mm/yr.)	Actual Evapotranspiration (mm/yr.)	Precipitation Surplus (mm/yr.)
Urban Lawns/Golf Courses					
Fine Sand	A	0.04	-	-	-
Fine Sandy Loam	B		893	432	461
Silt Loam	C		-	-	-
Clay	D		-	-	-
Forest					
Fine Sand	A	5.78	893	583	310
Fine Sandy Loam	B		893	626	267
Silt Loam	C		893	587	306
Clay	D		893	584	309
Pasture & Shrubs					
Fine Sand	A	1.09	893	596	297
Fine Sandy Loam	B		893	632	261
Silt Loam	C		893	596	297
Clay	D		893	537	356
Non-Intensive Agriculture (e.g. Hay)					
Fine Sand	A	8.93	893	606	287
Fine Sandy Loam	B		893	634	259
Silt Loam	C		893	615	278
Clay	D		893	629	264
Intensive Agriculture (e.g. Row crop)					
Fine Sand	A	35.46	893	603	290
Fine Sandy Loam	B		893	635	258
Silt Loam	C		893	592	301
Clay	D		893	574	319
Open Alvar					
Fine Sand	A	-	-	-	-
Fine Sandy Loam	B		-	-	-
Silt Loam	C		-	-	-
Clay	D		-	-	-
Aggregates					
Fine Sand	A	-	-	-	-
Fine Sandy Loam	B		-	-	-
Silt Loam	C		-	-	-
Clay	D		-	-	-
Mean Annual			**893**	**599**	**293**

Notes: Precipitation and Actual Evapotranspiration values are the AVERAGE ANNUAL estimates obtained from the Lake Simcoe PRMS model (Earthfx, 2010).

Oro Creeks North Subwatershed

	Hydrologic Soil Group	Subwatershed Area (km^2)	Mean Annual Precipitation (mm/yr.)	Actual Evapotranspiration (mm/yr.)	Precipitation Surplus (mm/yr.)
Urban Lawns/Golf Courses					
Fine Sand	A	0.50	990	509	482
Fine Sandy Loam	B		990	572	418
Silt Loam	C		990	586	404
Clay	D		-	-	-
Forest					
Fine Sand	A	19.74	990	561	429
Fine Sandy Loam	B		990	606	385
Silt Loam	C		990	602	388
Clay	D		990	654	336
Pasture & Shrubs					
Fine Sand	A	2.04	990	553	437
Fine Sandy Loam	B		990	618	373
Silt Loam	C		990	621	369
Clay	D		990	588	402
Non-Intensive Agriculture (e.g. Hay)					
Fine Sand	A	18.06	990	570	420
Fine Sandy Loam	B		990	623	368
Silt Loam	C		990	626	364
Clay	D		990	659	332
Intensive Agriculture (e.g. Row crop)					
Fine Sand	A	7.32	990	568	423
Fine Sandy Loam	B		990	631	360
Silt Loam	C		990	652	339
Clay	D		990	619	372
Open Alvar					
Fine Sand	A	-	-	-	-
Fine Sandy Loam	B		-	-	-
Silt Loam	C		-	-	-
Clay	D		-	-	-
Aggregates					
Fine Sand	A	1.50	990	476	515
Fine Sandy Loam	B		-	-	-
Silt Loam	C		990	490	500
Clay	D		-	-	-
Mean Annual			**990**	**562**	**427**

Notes: Precipitation and Actual Evapotranspiration values are the AVERAGE ANNUAL estimates obtained from the Lake Simcoe PRMS model (Earthfx, 2010).

Oro Creeks South Subwatershed

	Hydrologic Soil Group	Subwatershed Area (km^2)	Mean Annual Precipitation (mm/yr.)	Actual Evapotranspiration (mm/yr.)	Precipitation Surplus (mm/yr.)
Urban Lawns/Golf Courses					
Fine Sand	A	0.64	961	622	339
Fine Sandy Loam	B		961	574	387
Silt Loam	C		-	-	-
Clay	D		-	-	-
Forest					
Fine Sand	A	16.66	961	591	370
Fine Sandy Loam	B		961	626	335
Silt Loam	C		961	603	359
Clay	D		-	-	-
Pasture & Shrubs					
Fine Sand	A	0.83	961	608	354
Fine Sandy Loam	B		961	635	326
Silt Loam	C		961	640	321
Clay	D		-	-	-
Non-Intensive Agriculture (e.g. Hay)					
Fine Sand	A	11.52	961	584	378
Fine Sandy Loam	B		961	650	312
Silt Loam	C		961	640	321
Clay	D		-	-	-
Intensive Agriculture (e.g. Row crop)					
Fine Sand	A	10.44	961	582	379
Fine Sandy Loam	B		961	652	309
Silt Loam	C		961	650	312
Clay	D		-	-	-
Open Alvar					
Fine Sand	A	-	-	-	-
Fine Sandy Loam	B		-	-	-
Silt Loam	C		-	-	-
Clay	D		-	-	-
Aggregates					
Fine Sand	A	-	-	-	-
Fine Sandy Loam	B		-	-	-
Silt Loam	C		-	-	-
Clay	D		-	-	-
Mean Annual			**961**	**608**	**354**

Notes: Precipitation and Actual Evapotranspiration values are the AVERAGE ANNUAL estimates obtained from the Lake Simcoe PRMS model (Earthfx, 2010).

Pefferlaw Brook Subwatershed

	Hydrologic Soil Group	Subwatershed Area (km^2)	Mean Annual Precipitation (mm/yr.)	Actual Evapotranspiration (mm/yr.)	Precipitation Surplus (mm/yr.)
Urban Lawns/Golf Courses					
Fine Sand	A	5.06	897	529	368
Fine Sandy Loam	B		897	551	346
Silt Loam	C		897	601	296
Clay	D		897	608	289
Forest					
Fine Sand	A	54.17	897	552	345
Fine Sandy Loam	B		897	611	286
Silt Loam	C		897	596	301
Clay	D		897	651	246
Pasture & Shrubs					
Fine Sand	A	8.73	897	552	345
Fine Sandy Loam	B		897	582	315
Silt Loam	C		897	584	313
Clay	D		897	611	286
Non-Intensive Agriculture (e.g. Hay)					
Fine Sand	A	59.27	897	574	323
Fine Sandy Loam	B		897	634	263
Silt Loam	C		897	649	248
Clay	D		897	637	260
Intensive Agriculture (e.g. Row crop)					
Fine Sand	A	57.79	897	570	327
Fine Sandy Loam	B		897	624	273
Silt Loam	C		897	650	247
Clay	D		897	652	245
Open Alvar					
Fine Sand	A	-	-	-	-
Fine Sandy Loam	B		-	-	-
Silt Loam	C		-	-	-
Clay	D		-	-	-
Aggregates					
Fine Sand	A	8.10	897	432	465
Fine Sandy Loam	B		897	448	449
Silt Loam	C		897	671	226
Clay	D		-	-	-
Mean Annual			**897**	**572**	**325**

Notes: Precipitation and Actual Evapotranspiration values are the AVERAGE ANNUAL estimates obtained from the Lake Simcoe PRMS model (Earthfx, 2010).

Ramara Creeks Subwatershed

	Hydrologic Soil Group	Subwatershed Area (km^2)	Mean Annual Precipitation (mm/yr.)	Actual Evapotranspiration (mm/yr.)	Precipitation Surplus (mm/yr.)
Urban Lawns/Golf Courses					
Fine Sand	A	1.10	966	576	390
Fine Sandy Loam	B		966	653	313
Silt Loam	C		966	638	328
Clay	D		966	676	290
Forest					
Fine Sand	A	13.12	966	565	401
Fine Sandy Loam	B		966	614	352
Silt Loam	C		966	599	367
Clay	D		966	657	309
Pasture & Shrubs					
Fine Sand	A	3.09	966	546	420
Fine Sandy Loam	B		966	625	341
Silt Loam	C		966	612	354
Clay	D		966	627	339
Non-Intensive Agriculture (e.g. Hay)					
Fine Sand	A	54.65	966	591	375
Fine Sandy Loam	B		966	652	314
Silt Loam	C		966	661	305
Clay	D		966	654	312
Intensive Agriculture (e.g. Row crop)					
Fine Sand	A	14.65	966	581	385
Fine Sandy Loam	B		966	663	303
Silt Loam	C		966	663	303
Clay	D		966	639	327
Open Alvar					
Fine Sand	A	-	-	-	-
Fine Sandy Loam	B		-	-	-
Silt Loam	C		-	-	-
Clay	D		-	-	-
Aggregates					
Fine Sand	A	0.43	-	-	-
Fine Sandy Loam	B		966	525	441
Silt Loam	C		966	502	464
Clay	D		966	540	426
Mean Annual			**966**	**605**	**361**

Notes: Precipitation and Actual Evapotranspiration values are the AVERAGE ANNUAL estimates obtained from the Lake Simcoe PRMS model (Earthfx, 2010).

Talbot River Subwatershed

	Hydrologic Soil Group	Subwatershed Area (km^2)	Mean Annual Precipitation (mm/yr.)	Actual Evapotranspiration (mm/yr.)	Precipitation Surplus (mm/yr.)
Urban Lawns/Golf Courses					
Fine Sand	A	0.29	940	533	407
Fine Sandy Loam	B		940	546	394
Silt Loam	C		940	639	301
Clay	D		-	-	-
Forest					
Fine Sand	A	9.47	940	566	374
Fine Sandy Loam	B		940	579	361
Silt Loam	C		940	580	360
Clay	D		940	587	353
Pasture & Shrubs					
Fine Sand	A	2.79	940	595	345
Fine Sandy Loam	B		940	607	333
Silt Loam	C		940	583	357
Clay	D		940	537	403
Non-Intensive Agriculture (e.g. Hay)					
Fine Sand	A	29.21	940	593	347
Fine Sandy Loam	B		940	608	332
Silt Loam	C		940	623	317
Clay	D		940	628	312
Intensive Agriculture (e.g. Row crop)					
Fine Sand	A	7.82	940	572	368
Fine Sandy Loam	B		940	618	322
Silt Loam	C		940	586	354
Clay	D		940	652	288
Open Alvar					
Fine Sand	A	0.06	-	-	-
Fine Sandy Loam	B		940	506	434
Silt Loam	C		940	503	437
Clay	D		-	-	-
Aggregates					
Fine Sand	A	1.39	940	490	450
Fine Sandy Loam	B		940	507	433
Silt Loam	C		940	468	472
Clay	D		940	453	487
Mean Annual			**940**	**587**	**353**

Notes: Precipitation and Actual Evapotranspiration values are the AVERAGE ANNUAL estimates obtained from the Lake Simcoe PRMS model (Earthfx, 2010).

Upper Talbot River Subwatershed

	Hydrologic Soil Group	Subwatershed Area (km^2)	Mean Annual Precipitation (mm/yr.)	Actual Evapotranspiration (mm/yr.)	Precipitation Surplus (mm/yr.)
Urban Lawns/Golf Courses					
Fine Sand	A	0.43	952	479	474
Fine Sandy Loam	B		952	517	435
Silt Loam	C		-	-	-
Clay	D		952	612	340
Forest					
Fine Sand	A	70.50	952	557	395
Fine Sandy Loam	B		952	586	366
Silt Loam	C		952	596	356
Clay	D		952	556	396
Pasture & Shrubs					
Fine Sand	A	37.78	952	546	406
Fine Sandy Loam	B		952	581	371
Silt Loam	C		952	544	408
Clay	D		952	583	369
Non-Intensive Agriculture (e.g. Hay)					
Fine Sand	A	9.56	952	538	414
Fine Sandy Loam	B		952	562	390
Silt Loam	C		952	575	377
Clay	D		952	588	364
Intensive Agriculture (e.g. Row crop)					
Fine Sand	A	26.17	952	528	424
Fine Sandy Loam	B		952	599	353
Silt Loam	C		952	629	323
Clay	D		952	559	393
Open Alvar					
Fine Sand	A	-	-	-	-
Fine Sandy Loam	B		-	-	-
Silt Loam	C		-	-	-
Clay	D		-	-	-
Aggregates					
Fine Sand	A	1.70	952	474	478
Fine Sandy Loam	B		952	549	403
Silt Loam	C		952	493	459
Clay	D		-	-	-
Mean Annual			**952**	**568**	**384**

Notes: Precipitation and Actual Evapotranspiration values are the AVERAGE ANNUAL estimates obtained from the Lake Simcoe PRMS model (Earthfx, 2010).

Uxbridge Brook Subwatershed

	Hydrologic Soil Group	Subwatershed Area (km^2)	Mean Annual Precipitation (mm/yr.)	Actual Evapotranspiration (mm/yr.)	Precipitation Surplus (mm/yr.)
Urban Lawns/Golf Courses					
Fine Sand	A	1.74	892	532	360
Fine Sandy Loam	B		892	560	332
Silt Loam	C		892	616	276
Clay	D		-	-	-
Forest					
Fine Sand	A	30.46	892	551	341
Fine Sandy Loam	B		892	606	286
Silt Loam	C		892	591	301
Clay	D		892	531	361
Pasture & Shrubs					
Fine Sand	A	5.20	892	548	344
Fine Sandy Loam	B		892	591	301
Silt Loam	C		892	613	279
Clay	D		892	508	385
Non-Intensive Agriculture (e.g. Hay)					
Fine Sand	A	35.79	892	561	331
Fine Sandy Loam	B		892	625	267
Silt Loam	C		892	624	268
Clay	D		892	569	323
Intensive Agriculture (e.g. Row crop)					
Fine Sand	A	43.40	892	585	307
Fine Sandy Loam	B		892	627	265
Silt Loam	C		892	627	265
Clay	D		892	525	367
Open Alvar					
Fine Sand	A	-	-	-	-
Fine Sandy Loam	B		-	-	-
Silt Loam	C		-	-	-
Clay	D		-	-	-
Aggregates					
Fine Sand	A	1.75	892	433	459
Fine Sandy Loam	B		892	416	476
Silt Loam	C		892	490	402
Clay	D		-	-	-
Mean Annual			**892**	**574**	**317**

Notes: Precipitation and Actual Evapotranspiration values are the AVERAGE ANNUAL estimates obtained from the Lake Simcoe PRMS model (Earthfx, 2010).

West Holland Subwatershed

	Hydrologic Soil Group	Subwatershed Area (km^2)	Mean Annual Precipitation (mm/yr.)	Actual Evapotranspiration (mm/yr.)	Precipitation Surplus (mm/yr.)
Urban Lawns/Golf Courses					
Fine Sand	A	4.38	868	537	331
Fine Sandy Loam	B		868	613	255
Silt Loam	C		868	598	270
Clay	D		-	-	-
Forest					
Fine Sand	A	47.88	868	559	309
Fine Sandy Loam	B		868	614	254
Silt Loam	C		868	647	221
Clay	D		868	634	234
Pasture & Shrubs					
Fine Sand	A	12.54	868	586	282
Fine Sandy Loam	B		868	610	258
Silt Loam	C		868	640	228
Clay	D		868	645	223
Non-Intensive Agriculture (e.g. Hay)					
Fine Sand	A	46.19	868	581	287
Fine Sandy Loam	B		868	618	250
Silt Loam	C		868	663	205
Clay	D		868	665	203
Intensive Agriculture (e.g. Row crop)					
Fine Sand	A	153.92	868	576	292
Fine Sandy Loam	B		868	606	262
Silt Loam	C		868	659	209
Clay	D		868	660	208
Open Alvar					
Fine Sand	A	-	-	-	-
Fine Sandy Loam	B		-	-	-
Silt Loam	C		-	-	-
Clay	D		-	-	-
Aggregates					
Fine Sand	A	0.07	868	496	372
Fine Sandy Loam	B		868	506	362
Silt Loam	C		-	-	-
Clay	D		-	-	-
Mean Annual			**868**	**605**	**264**

Notes: Precipitation and Actual Evapotranspiration values are the AVERAGE ANNUAL estimates obtained from the Lake Simcoe PRMS model (Earthfx, 2010).

Whites Creek Subwatershed

	Hydrologic Soil Group	Subwatershed Area (km^2)	Mean Annual Precipitation (mm/yr.)	Actual Evapotranspiration (mm/yr.)	Precipitation Surplus (mm/yr.)
Urban Lawns/Golf Courses					
Fine Sand	A	0.12	925	538	387
Fine Sandy Loam	B		925	408	517
Silt Loam	C		925	636	289
Clay	D		-	-	-
Forest					
Fine Sand	A	8.37	925	577	348
Fine Sandy Loam	B		925	603	322
Silt Loam	C		925	589	336
Clay	D		925	612	313
Pasture & Shrubs					
Fine Sand	A	3.34	925	569	356
Fine Sandy Loam	B		925	612	313
Silt Loam	C		925	579	346
Clay	D		925	570	355
Non-Intensive Agriculture (e.g. Hay)					
Fine Sand	A	40.79	925	599	327
Fine Sandy Loam	B		925	637	288
Silt Loam	C		925	622	303
Clay	D		925	641	284
Intensive Agriculture (e.g. Row crop)					
Fine Sand	A	21.31	925	579	346
Fine Sandy Loam	B		925	642	283
Silt Loam	C		925	621	304
Clay	D		925	643	282
Open Alvar					
Fine Sand	A	0.19	-	-	-
Fine Sandy Loam	B		925	528	397
Silt Loam	C		925	534	391
Clay	D		-	-	-
Aggregates					
Fine Sand	A	0.15	925	493	432
Fine Sandy Loam	B		-	-	-
Silt Loam	C		-	-	-
Clay	D		-	-	-
Mean Annual			**925**	**602**	**323**

Notes: Precipitation and Actual Evapotranspiration values are the AVERAGE ANNUAL estimates obtained from the Lake Simcoe PRMS model (Earthfx, 2010).